

PTC® Live Global

Streamlining Change Management with Business Rules

Christopher Savelle

Software Engineer

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Who We Are

- Kennedy Space Center, Florida
- Talents
 - Engineers
 - IT
 - Software Development
- Our Job
 - Administer
 - Improve/Automate processes
- Not our Job
 - Server Side

WHAT ARE BUSINESS RULES?

- **Persistable Windchill objects**
 - Set
 - Rule
 - Link
- **Control the quality of data**
 - Don't let improperly configured data through.
- **Reduce the time to complete tasks**
 - Does the validation before the checker/approver even gets the task.
 - Can automatically reroute if there is a fail.
- **Customizable to meet specific needs**
 - Check for attributes, state of the object or even states of dependent objects.

BUSINESS RULE OBJECTS

- **Sets**

SET

BUSINESS RULE OBJECTS

- **Sets, Rules**

SET

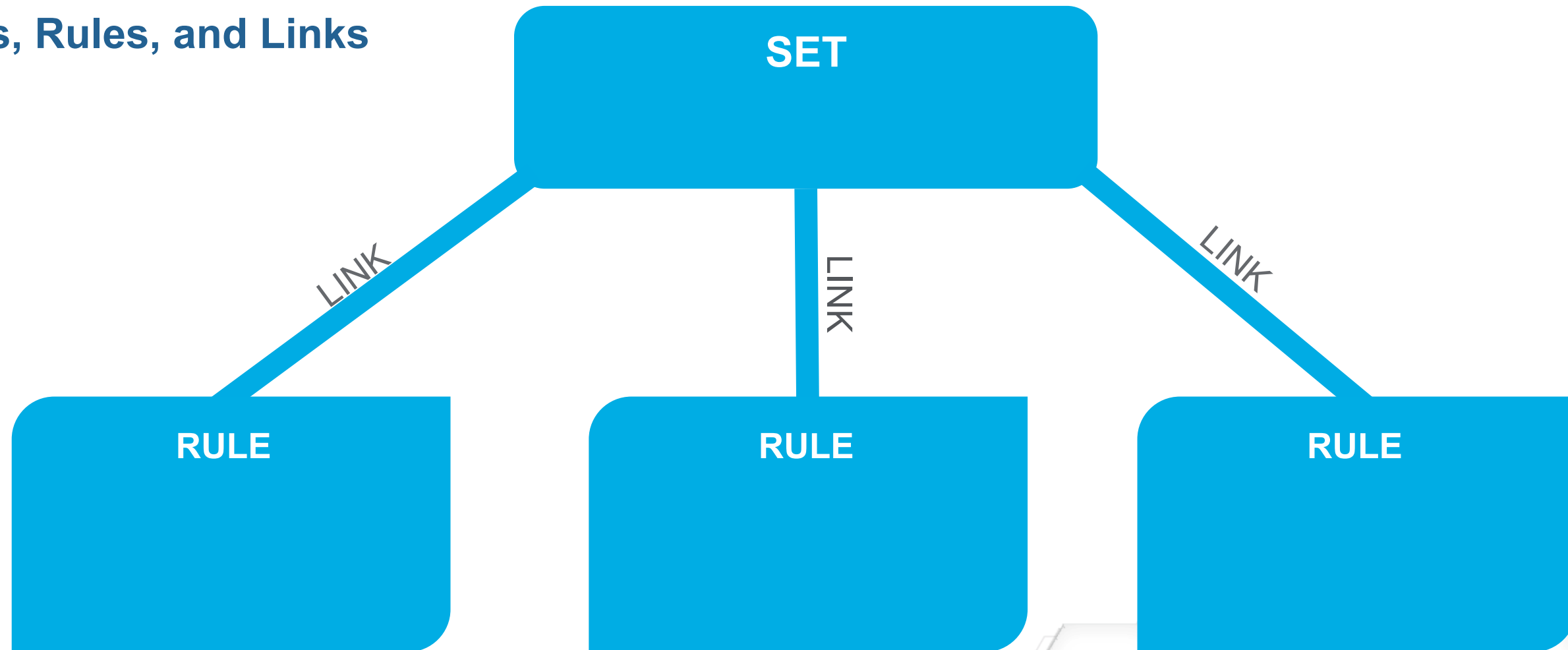
RULE

RULE

RULE

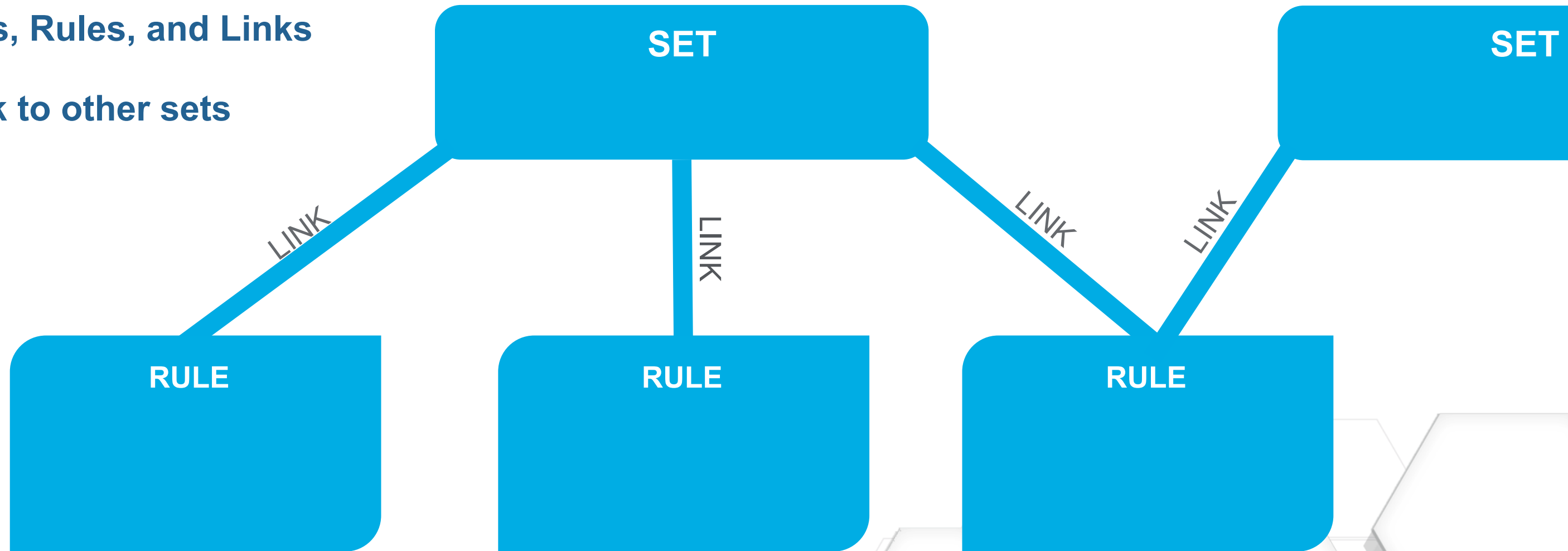
BUSINESS RULE OBJECTS

- **Sets, Rules, and Links**



BUSINESS RULE OBJECTS

- **Sets, Rules, and Links**
- **Link to other sets**



BUSINESS RULE OBJECTS

Business Rule Selector	Rule Validation “com.ptc.core.businessRules.validation”	Description
CHECKOUT_RULE	CheckoutRuleValidator	Validates that objects are not checked out.
RELEASE_TARGET	ReleaseTargetValidator	Ensures that all “Resulting Objects” are at an appropriate state for release and have an appropriate change management transition specified that is consistent with the assigned lifecycle transition rules.
ATTRIBUTE_RULE	AttributeRuleValidator	Validates that the specified attribute rule configuration for an object type is valid.
BOM_RELEASE_RULE	BOMReleaseRuleValidator	Ensures that all resulting objects are at an appropriate state and all their first level children are at an appropriate state.

CREATING BUSINESS RULES (Traditional Approach)

- **XML files**
 - Set.xml
 - Rule.xml *
 - Link.xml *
 - LoadFile.xml
- **Zip the business rule objects.**
 - The set, rule and link files
- **Call out the LoadFile.xml**
 - Use the LoadFromFile command in a Windchill shell

CREATING BUSINESS RULES (Traditional Approach)

- **XML Tips**

- Must follow standardX20.dtd
 - <Windchill>codebase\registry\ixb\dtds\standardX20.dtd\businessRules.dtd
 - Defines the elements and the structure of the XML document

- Check your spelling!

`</BuisnessRuleLink>` → `</BusinessRuleLink>`

`<localID>` → `<localId>`

- White space is preserved

`<key>`
 `ACME_PART_ATTRIBUTE_RULE`
`</key>` → `<key>ACME_PART_ATTRIBUTE_RULE</key>`

EXAMPLES ATTRIBUTES

- **Requirements**

- WTPart number must begin with an 'A'
- WTPart cage code must be from the set
 - [ACM01,ACM02,ACM03,ACM04]

- **To Do**

- Create set.xml file
- Create rule.xml file
- Create link.xml file
- Create load.xml file
- Execute load from file command

CREATING BUSINESS RULES

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE BusinessRuleSet SYSTEM "standardX20.dtd">
<BusinessRuleSet>
  <ObjectID>
    <localId>wt.businessRules.BusinessRuleSet:00001</localId>
  </ObjectID>
  <objectContainerPath>/wt.inf.container.OrgContainer=ACME</objectContainerPath>
  <key>ACME_PRE_RELEASE II</key>
  <name>ACME_ReleaseRuleSet</name>
  <description>To test basic Attribute RuleSet Validation</description>
  <enabled>true</enabled>
  <overridable>true</overridable>
  <updateIfExists>true</updateIfExists>
</BusinessRuleSet>
```

SET (wt.businessRules.BusinessRuleSet)

- Identification
 - OID
 - Key
 - Name
- Where
 - Container Path
- Other
 - Description
 - Enabled
 - Overridable

CREATING BUSINESS RULES

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE BusinessRule SYSTEM "standardX20.dtd">
<BusinessRule>
  <ObjectID><localId>wt.businessRules.BusinessRule:000001</localId></ObjectID>
  <objectContainerPath>/wt.inf.container.OrgContainer=ACME</objectContainerPath>
  <key>ACME_PART_ATTRIBUTE_RULE</key>
  <selector>ATTRIBUTE_RULE</selector>
  <name>ACME Number Rule</name>
  <description>Number must always begin with an 'A'</description>
  <enabled>true</enabled>
  <updateIfExists>true</updateIfExists>
  <configs>
    <config name="objectType" value="wt.part.WTPart"></config>
    <config name="CAGE_CODE" value="[ACM01,ACM02,ACM03,ACM04]"></config>
    <config name="number" value="BEGINSWITH(A)"></config>
  </configs>
</BusinessRule>
```

RULE (wt.businessRules.BusinessRule)

- Configs
 - Name-Value pair
 - Name is the internal name

CREATING BUSINESS RULES

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE BusinessRuleLink SYSTEM "standardX20.dtd">
<BusinessRuleLink>
  <ObjectID>
    <localId>wt.businessRules.BusinessRuleLink:000001</localId>
  </ObjectID>
  <ruleSet>
    <ObjectReference>
      <localId>wt.businessRules.BusinessRuleSet:000001</localId>
    </ObjectReference>
  </ruleSet>
  <rule>
    <ObjectReference>
      <localId>wt.businessRules.BusinessRule:000001</localId>
    </ObjectReference>
  </rule>
  <blockNumber>1</blockNumber>
  <updateIfExists>true</updateIfExists>
</BusinessRuleLink>
```

LINK (wt.businessRules.BusinessRuleLink)

- Reference Set
- Reference Rule
- State block number

LOADING BUSINESS RULES

LoadRules.xml

- Call this file from a Windchill shell
- If any of the xml files are not formatted correctly, an error will be thrown and nothing will be imported*

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE NmLoader SYSTEM "standardX20.dtd">

<NmLoader>
  <csvExecuteImport handler="wt.Load.LoadImport.executeImport">
    <csvimportFilename>loadFiles/ixbImport/Examples/One/RuleConfiguration_One.zip
  </csvimportFilename>
  </csvExecuteImport>
</NmLoader>
```

```
windchill wt.load.LoadFromFile -d <Windchill>\pathTo\LoadRules.xml
```

LOADING BUSINESS RULES

Windchill Shell Output

- All objects were imported successfully.
- Check method server output for successful completion of all loads.

LOADING BUSINESS RULES

Windchill Shell Output

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Method Server Log Output

- Unable to create a BusinessRuleLink object without both a ruleSet and a rule
- All objects were imported successfully

LOADING BUSINESS RULES

Windchill Shell Output

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Method Server Log Output

- Unable to create a BusinessRuleLink object without both a ruleSet and a rule
- All objects were imported successfully

Key ↑	Name	Context	Enabled	Overrid...	Ord...	Description
⋮ ACME_PRE_RELEASE	ACME_ReleaseRuleSet	Rocket	Yes	Yes		To test basic Attribute RuleSet Validation
⊕ CHANGEABLE_PRE_RELEASE	Change Pre-Release Validation	Site	Yes	Yes		Business Rule Set used before objects are released as part of

LOADING BUSINESS RULES

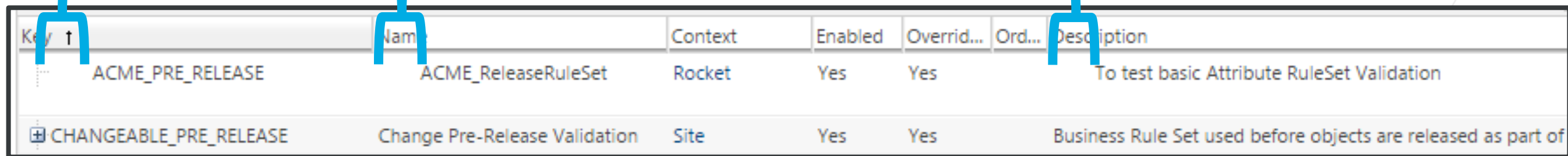
Windchill Shell Output

- All objects were imported successfully.
- Check method server output for successful completion of all loads.

Method Server Log Output

- Unable to create a BusinessRuleLink object without both a ruleSet and a rule
- All objects were imported successfully

That doesn't look right!



Key ↑	Name	Context	Enabled	Overrid...	Ord...	Description
ACME_PRE_RELEASE	ACME_ReleaseRuleSet	Rocket	Yes	Yes		To test basic Attribute RuleSet Validation
CHANGEABLE_PRE_RELEASE	Change Pre-Release Validation	Site	Yes	Yes		Business Rule Set used before objects are released as part of

LOADING BUSINESS RULES

Windchill Shell Output

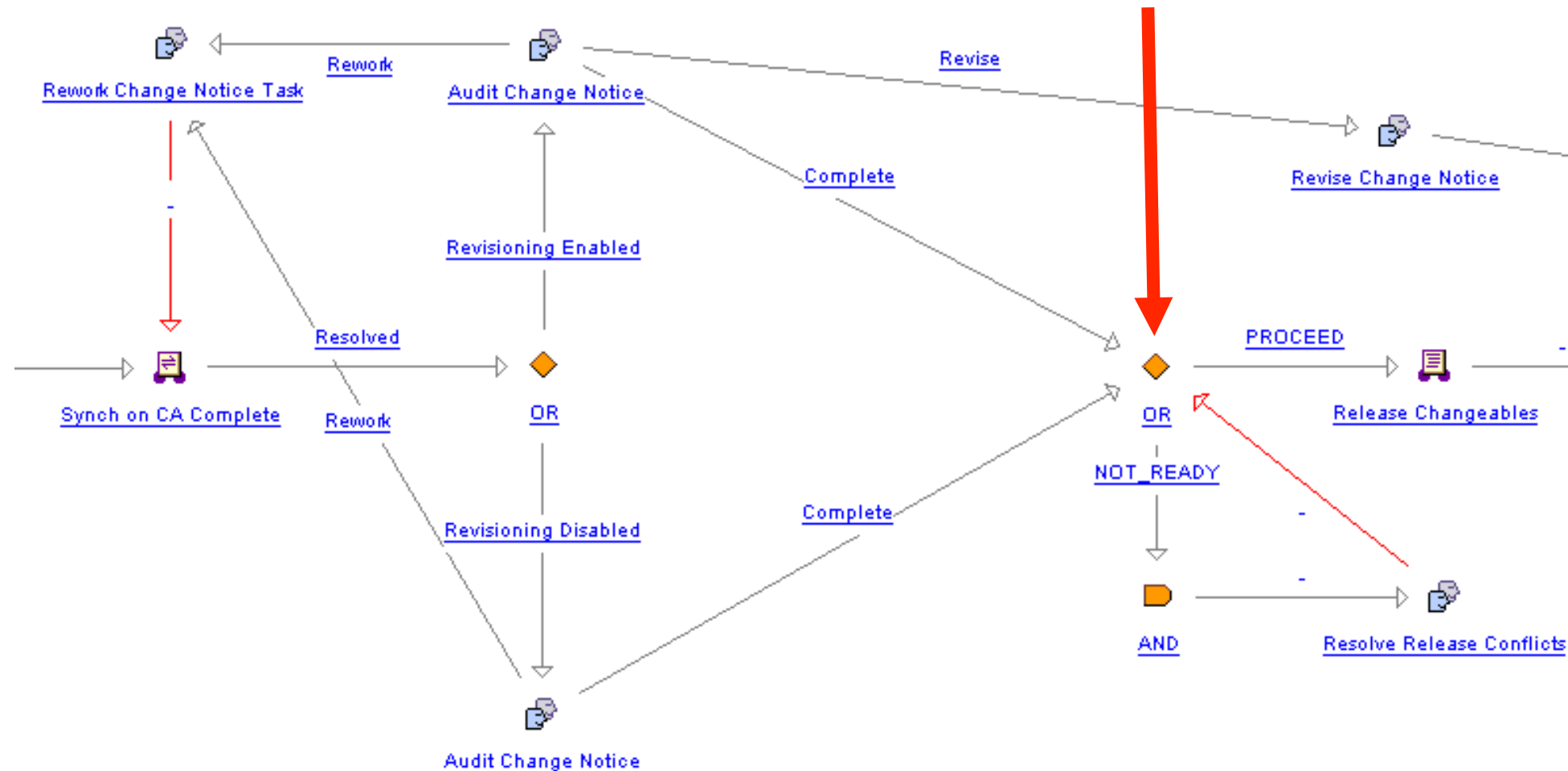
- All objects were imported successfully.
- Check method server output for successful completion of all loads.

Key ↑	Name	Context	Enabled	Overrid...	Ord...	Description
ACME_PRE_RELEASE	ACME_ReleaseRuleSet	Rocket	Yes	Yes		To test basic Attribute RuleSet Validation
ACME_PRE_RELEASE_II	ACME_ReleaseRuleSet	ACME	Yes	Yes		To test basic Attribute RuleSet Validation
ACME_PART_ATTRIBUTE_RULE	ACME Number Rule	ACME	Yes		1	Number must always begin with an 'A'
CHANGEABLE_PRE_RELEASE	Change Pre-Release Validation	Site	Yes	Yes		Business Rule Set used before objects are released as part of

Configure Workflow

Default Change Notice Workflow

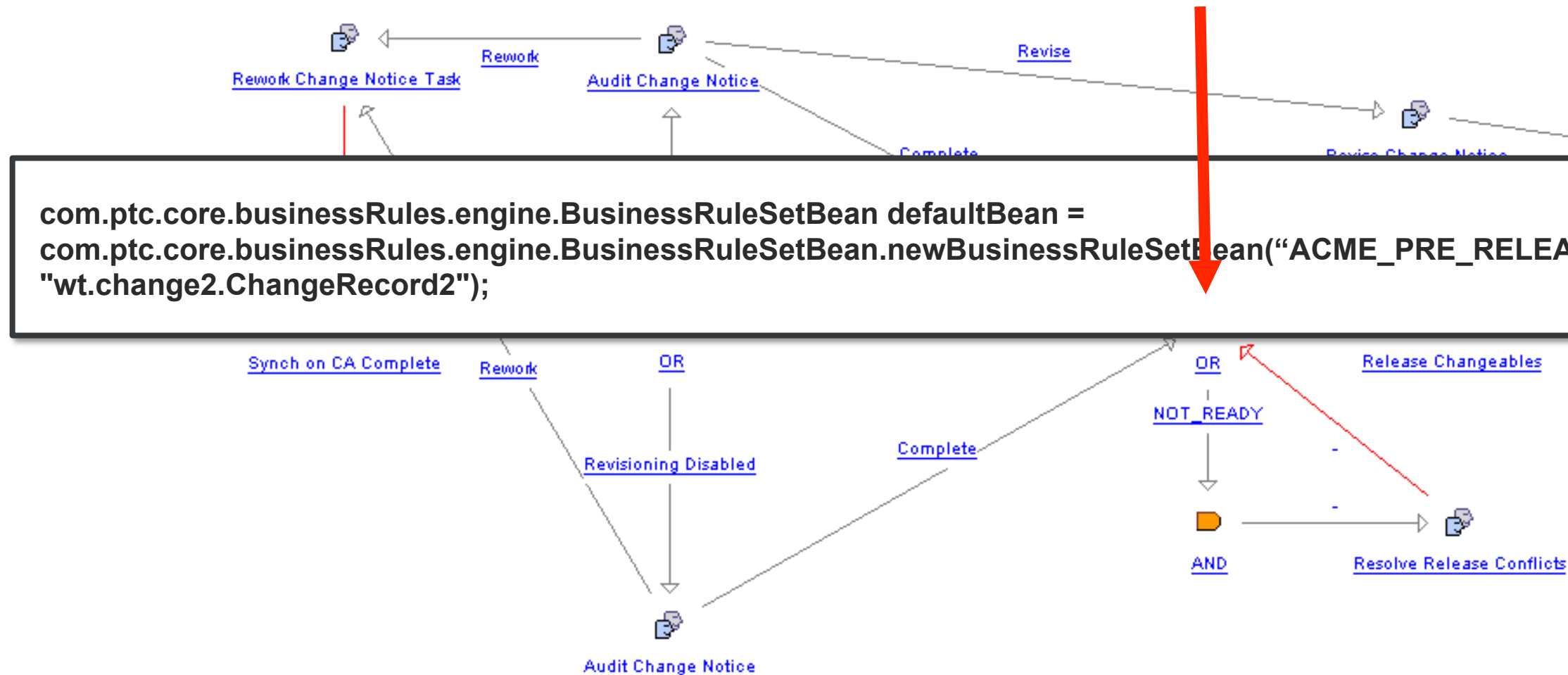
- Edit Change Notice Workflow
 - Edit conditional in Resolve Conflicts loop.



Configure Workflow

Default Change Notice Workflow

- Change name of set to the newly created set



Configure Workflow

Release Part

Product: Rocket
Type: Part
Number: B00001
Name: ACME X1 Rocket
Version: A.4 (Design)

Attributes

* **Assembly Mode:** Separable ▼

* **Source:** Make ▼

Cage Code: ACM-0

Design Authority:

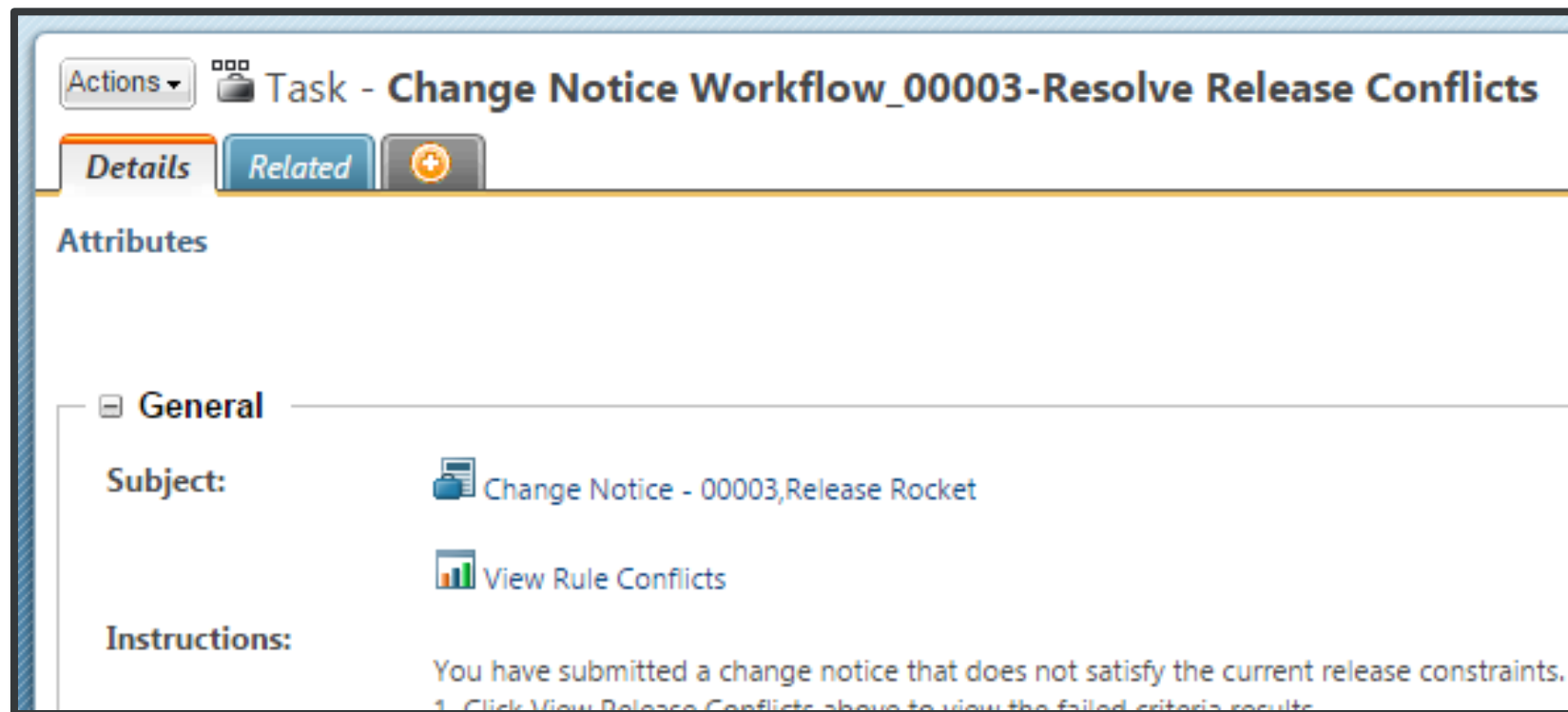
ITAR Controlled: ☐ Undefined
☒ Yes
☐ No

Weight: kg

Configure Workflow

Resolve Release Conflicts task

- Click on View Rule Conflicts



Configure Workflow

Resolve Release Conflicts task

- Click on View Rule Conflicts
- View conflicts

Actions Task - Change Notice Workflow_00003-Resolve Release Conflicts

View Rule Conflicts

Rule Conflicts Group by Rule (2 objects)

Actions Find in tree

Rule Name	Identity ↑	Conflicts
ACME Number Rule (1)	B00001, ACME X1 Rocket, A.4 (Design)	Error : Cage Code is not in the discrete set [ACM01, ACM02, ACM03, ACM04]. Error : Number does not start with A.

You have submitted a change notice that does not satisfy the current release constraints.
1. Click View Release Conflicts above to view the failed criteria results.

CREATING BUSINESS RULES – (Custom Approach)

- **No more XML files**
 - No longer have to be familiar with XML syntax
 - Cuts down on human error
 - Saves time
- **No more local actions**
 - Some administrators do not have access
- **Windchill API**
 - Utility Class
 - Query, Create, Modify and Delete
 - JSP Web based GUI
 - Fast
 - Instant gratification

CREATING BUSINESS RULES – (Custom Approach)

Business Rules

Business Rule Sets

Choose Business Rule Set

CREATING BUSINESS RULES – (Custom Approach)

Business Rules

Business Rule Sets

Choose Business Rule Set

Select Set

- CHANGEABLE_PRE_RELEASE
- ROCKET_CONFIG
- ROCKET_RELEASE
- ACME_PRE_RELEASE
- ACME_PRE_RELEASE_II**

CREATING BUSINESS RULES – (Custom Approach)

Business Rules

Business Rule Sets

Choose Business Rule Set

ACME_PRE_RELEASE_II

New Set

SET

ID: ACME_PRE_RELEASE_II

NAME: ACME_ReleaseRuleSet

DESCRIPTION: To test basic Attribute RuleSet Validation

CONTEXT: ACME

ENABLED true

OVERRIDABLE true

RULE

ID: ACME_PART_ATTRIBUTE_RULE

NAME: ACME Number Rule

DESCRIPTION: Number must always begin with an 'A'

CONTEXT: ACME

SELECTOR: ATTRIBUTE_RULE

ENABLED true

BLOCK 1

CONFIG {CAGE_CODE=[ACM01,ACM02,ACM03,ACM04],
objectType=wt.part.WTPart, number=BEGINSWITH(A)}

Edit Rule

New Rule

Edit Set

CREATING BUSINESS RULES – (Custom Approach)

- **Requirements**
 - Required Attributes must be set
 - Number must start with an 'A'
 - Number must end with a '-PT'
 - Number cannot contain special characters
 - Part cannot be from a vendor

EXAMPLES ATTRIBUTES

Edit Rule

Edit Rule Properties

Attribute	Current	New
RULE ID	RC_ATTRIBUTE_RULE	Cannot Modify
SET	ROCKET_CONFIG	ROCKET_CONFIG
NAME	Attribute Rule	Attribute Rule
DESCRIPTION	Verify required attributes are filled in.	Verify required attributes are 1
CONTEXT	ACME	(ORG) - ACME
ENABLED	true	true
BLOCK	2	2
CONFIG		<div>Add Config</div>
SELECTOR	ATTRIBUTE_RULE	ATTRIBUTE_RULE

Save

Delete

EXAMPLES ATTRIBUTES

Edit Rule

KEY

VALUE

CAGE_CODE

SET

Add Config

Close

Edit Rule

Attribut

RULE ID

SET

NAME

DESCRIPTION

CONTEXT

ENABLED

BLOCK

CONFIG

SELECTOR

Save

Delete

Attribute Rule

Verify required attributes are filled in.

ACME

true

2

ATTRIBUTE_RULE

Attribute Rule

Verify required attributes are 1

(ORG) - ACME

true

2

Add Config

ATTRIBUTE_RULE

EXAMPLES ATTRIBUTES

Edit Rule

Edit Rule Properties

Attribute	Current	New
RULE ID	RC_ATTRIBUTE_RULE	Cannot Modify
SET	ROCKET_CONFIG	ROCKET_CONFIG
NAME	Attribute Rule	Attribute Rule
DESCRIPTION	Verify required attributes are filled in.	Verify required attributes are 1
CONTEXT	ACME	(ORG) - ACME
ENABLED	true	true
BLOCK	2	2
CONFIG	CAGE_CODE=SET, DESIGN_AUTH=SET, ITAR_CONTROLLED=SET, WEIGHT=SET,	Add Config
SELECTOR	ATTRIBUTE_RULE	ATTRIBUTE_RULE

Save

Delete

EXAMPLES BOM RELEASE

- Create Set

Business Rules

Business Rule Sets

Choose Business Rule Set

EXAMPLES BOM RELEASE

- Create Set

New Set

Edit Set Properties

Attribute	Value
SET ID	ROCKET_RELEASE
NAME	Rocket Release
DESCRIPTION	This will check states of ch
CONTEXT	(ORG) - ACME ▼
ENABLED	true ▼
OVERRIDABLE	true ▼

Save

EXAMPLES BOM RELEASE

- Create Set
- Create Rule

Business Rules

Business Rule Sets

Choose Business Rule Set

SET

ID: ROCKET_RELEASE

NAME: Rocket Release

DESCRIPTION: This will check states of child objects

CONTEXT: Site

ENABLED true

OVERRIDABLE true

EXAMPLES BOM RELEASE

- Create Set
- Create Rule

New Rule

Edit Rule Properties

Attribute	Value
RULE ID	RR_VALIDATE_CHILDREI
SET	ROCKET_RELEASE
NAME	Validate Children
DESCRIPTION	Check that all dependent p
CONTEXT	(ORG) - ACME
ENABLED	true
CONFIG	
SELECTOR	BOM_RELEASE_RULE

Save

Example: {key1=value3, objectType=wt.part.WTPart}

EXAMPLES BOM RELEASE

- Create Set
- Create Rule

Edit Rule

Edit Rule Properties

Attribute	Current	New
RULE ID	RR_VALIDATE_CHILDREN	Cannot Modify
SET	ROCKET_RELEASE	ROCKET_RELEASE ▾
NAME	Validate Children States	Validate Children States
DESCRIPTION	Validates that all the dependent objects are at a valid state.	Validates that all the deper
CONTEXT	ACME	(ORG) - ACME ▾
ENABLED	true	true ▾
BLOCK	1	1
CONFIG		Add Config
SELECTOR	BOM_RELEASE_RULE	BOM_RELEASE_RULE ▾

Save

Delete

EXAMPLES BOM RELEASE

- Create Set
- Create Rule
 - targetState
 - collectionComponentID
 - validDependentState

Edit Rule

Edit Rule Properties

Attribute	Current	New
RULE ID	RR_VALIDATE_CHILDREN	Cannot Modify
SET	ROCKET_RELEASE	ROCKET_RELEASE ▼
NAME	Validate Children States	Validate Children States
DESCRIPTION	Validates that all the dependent objects are at a valid state.	Validates that all the deper
CONF	▼	
ENAB	targetState	RELEASED
BLO	Add Config	
CONFIG	Add Config	
SELECTOR	BOM_RELEASE_RULE	BOM_RELEASE_RULE ▼

Save Delete

EXAMPLES BOM RELEASE

- Create Set
- Create Rule
- Add configs
 - targetState
 - collectionComponentID
 - validDependentState

Business Rules

Business Rule Sets

Choose Business Rule Set

SET

ID: ROCKET_RELEASE

NAME: Rocket Release

DESCRIPTION: This will check states of child objects

CONTEXT: ACME

ENABLED true

OVERRIDABLE true

RULE

ID: RR_VALIDATE_CHILDREN

NAME: Validate Children States

DESCRIPTION: Validates that all the dependent objects are at a valid state.

CONTEXT: ACME

SELECTOR: BOM_RELEASE_RULE

ENABLED true

BLOCK 1

CONFIG {collectionComponentID=COLLECT_ITEMS_FOR_BOM_RELEASE_RULE, targetState=RELEASED, validDependentState=RELEASED}

EXAMPLES BOM RELEASE

- **Release End Item**
 - Structure has items In-Work

ACME X1 Rocket	In Work
SRB	Released
Stage 1	Released
LF Engine 1	Released
LF Tank 1	Released
Stage 2	Released
LF Engine 2	Released
LF Tank 2	Released
Stage 3	In Work
Command Module	Released
Escape Tower	In Work
Fairing	Released
LF Engine 3	Released
LF Tank 3	Released
Service Module	Released

EXAMPLES BOM RELEASE

- View Conflicts as usual

View Rule Conflicts

Rule Conflicts Group by Rule ▾

Actions ▾ Find in tree

Rule Name	Identity ↑	Conflicts
Validate Children States (1)		
...		
	A00001, ACME X1 Rocket, A.5 (Design)	Error : The life cycle state of one or more associated objects is not valid for releasing the target object. Valid life cycle states are: Released.

References

- **Windchill Help Center**
 - http://support.ptc.com/cs/help/windchill_hc/wc101_hc/index.jsp?id=BusRules&action=show
- **Windchill eSupport**
- **Windchill Javadocs**
- **W3Schools – XML Syntax**
 - http://www.w3schools.com/xml/xml_syntax.asp

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